



# Semiconductor Glossary

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**Notes**

Term (Index)	Definition
lithography	process used to transfer pattern from the mask/reticle to the layer of resist deposited on the surface of the wafer; kind of lithography depends on the wavelength of radiation used to expose resist: photolithography (or optical lithography) uses UV radiation, X-ray lithography uses X-ray, e-beam lithography uses electron beam, ion beam lithography uses ion beam.
electron beam (e-beam) lithography, EBL	lithography technique which uses focused beam of electrons to expose the resist; no mask is used as pattern is "written" directly into the resist by very fast scanning of electron beam; pattern transfer resolution below 100 nm; resolution is limited by the proximity effect; EBL is commonly used to manufacture high resolution masks for photolithography and X-ray lithography.
photolithography, optical lithography	pattern definition method which uses UV radiation to expose the resist; the most common lithography technique in semiconductor manufacturing; using extremely short wavelength UV (extreme UV; wavelengths below 200 nm), projection printing (steppers), phase shift masks, and adequate resist technology photolithography is capable of resolution below 100 nm.
resist	material sensitive to irradiation i.e. changes its chemical properties when irradiated; in the form of thin film used as a pattern transfer layer in lithographic processes in semiconductor manufacturing.
X-ray lithography	lithography method using X-ray to exposed the resist; due to shorter wavelength of X-ray radiation (0.4 - 4 nm)XRL allows higher resolution than photolithography which uses longer wavelength UV irradiation; XRL requires special mask and resists sensitive to X-rays..

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proximity effect	deleterious effect in e-beam lithography; scattering of electrons in irradiated resist; p.e. is responsible for the size of the exposed resist area being larger than the diameter of the incident electron beam; limits resolution of e-beam lithography.
raster scan	scanning mode in which beam is moving back and forth over the entire substrate; beam is turned on over designated area and then turned off until it will arrive at the next designated area.
variable shape beam	scanning mode in e-beam lithography in which shape of the beam is changing depending on the geometry of exposed area.
vector scan	scanning mode in which beam is scanning selected areas only; after scanning of selected area is completed beam is turned off and moved to another area to be scanned.
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Term (Index)	Definition
g - line lithography	photolithography using 436 nm wavelength UV radiation for exposure; (high-intensity line at 436 nm in the spectrum of UV lamp is referred to as "g-line").
i - line lithography	photolithography using 365 nm wavelength UV radiation for exposure; (high-intensity line at 436 nm in the spectrum of UV lamp is referred to as "i-line").

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Term (Index)	Definition
immersion lithography	photolithography techniques in which space between the final projection lens and the wafer in the exposure

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	tool is filled with water rather than air; use of medium featuring higher refractive index $n$ ( $n=1$ for air while $n=1.44$ for water) increases numerical aperture (NA) of the optical lithography tool, and hence, increases resolution of the pattern transfer process.
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Term (Index)	Definition
ion beam lithography, IBL	lithography technique in which resist is exposed by accelerated ions; due to the limited scattering of ions in the resist IBL may offer higher resolution than e-beam lithography.

Term (Index)	Definition
mask, X-ray lithography	see X-ray mask.

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photomask	mask used in photolithography to block resist exposure to UV radiation in selected areas; consists of chrome opaque areas supported by high quality quartz plate transparent to UV radiation.
stepper	resist exposure tool commonly used in photolithography; works using projection printing; in contrast to full-field exposure tools stepper exposes through the remotely located reticle only part of the wafer and repeats the process ("step-and-repeat") as many times as needed to expose entire wafer.
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X-ray mask	mask used in X-ray lithography; uses gold as an opaque material; gold pattern (defined using e-beam lithography) is supported by a thin membrane made out of material transparent to X-rays of given wavelength, e.g. $\text{Si}_3\text{N}_4$ , SiC and others.

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